

Title: “Nothing to do with the science”: How an elite sociotechnical imaginary cements policy resistance to public perspectives on science and technology through the machinery of government.

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Abstract

The lack of reflexivity and the dominance of technoscientific viewpoints amongst policymakers has been a common criticism of scientific decision-making, particularly in response to moves to democratise science. This paper uses the concept of sociotechnical imaginaries to understand the mechanism by which these technoscientific viewpoints exert power and gain agency, strength and durability, such that they persist over time and issue, despite deliberate efforts to disrupt this power relationship. Drawing on interviews with UK based National policymakers, I argue that an elite sociotechnical imaginary of “science to the rescue” shapes how public perspectives are heard and distinguishes what is expertise. Rather than constraining the agency of the policy actors however, it is the way in which the machinery of policymaking has become shaped around this imaginary - particularly its focus on science as a problem solver and on social and ethical issues as epiphenomena and “nothing to do with the science”- that gives this viewpoint its power, persistence and endurance. With this imaginary at the heart of policymaking machinery, regardless of the perspectives of the policymakers, alternative views of science are either forced to take the form of the elite imaginary in order to be processed, or they simply cannot be accounted for within the policymaking processes. In this way, the elite sociotechnical imaginary (and technoscientific viewpoint) is enacted, but also elicited and perpetuated without the need for

policymakers to engage with or even be aware of the imaginary underpinning their actions.

Introduction

The democratisation of science and technology has been a significant theme in science and technology studies over the past 20 years. As the role of science and technology has increasingly impacted on the lives of citizens, so too has our understanding of its uncertainty and insufficiency to provide the answers we once thought it could (for instance Beck, 1998; Jasanoff, 2010; Latour, 2004; B Wynne, 1998). In the face of resulting public controversies, such as those around Bovine Spongiform Encephalopathy (BSE), nuclear waste or climate change, many have argued that representative democracy itself appears to be unable to cope. This has led to calls for a move to more participatory approaches (Callon, Lascoumes, & Barthe, 2001; Giddens, 1998; Jasanoff, 2003; Wynne, 1993).

Alongside this, a perception of a wider democratic deficit emerged in the 1990s in Northern Europe and the USA. This resulted in the development of new techniques to involve citizens in policy decisions (Barnes, Newman and Sullivan, 2007), in fields ranging from environmental management and urban planning, to patient involvement in medical decision-making and international development.

In the UK in particular, such developments in participatory methods have been taken up in response to calls for the democratisation of science. This has created what amounts to a fifteen-year long experiment in public participation and dialogue. Starting from the 2000 House of Lords report 'Science and Society' (House of Lords Science and Technology Select Committee, 2000), the focus of the UK

Government's work to mediate the relationship between citizens and new and emerging technologies has focused on a series of 'mini-public' events. These events, which have fallen under the umbrella of the 'ScienceWise' programme since 2004, have brought together small groups of selected citizens and taken them through discussions about various aspects of new and emerging sciences and technologies, with the aim of seeking to inform policy, such that policy takes better account of public perspectives.

Many of those who have examined and evaluated this 'mini-public' approach to democratising science and technology have concluded that it is problematic however. They have found little evidence that public perspectives have been taken up by policy (Goodin, 2006; Wynne, 2006a; Stirling, 2007; Kurath and Gisler, 2009; Hansen and Allansdottir, 2011; Loeber, Griessler and Versteeg, 2011; Irwin, Jensen and Jones, 2012; Smallman, 2018). Explanations for this apparent resistance of policy to public perspectives tend to focus on the dominance of technoscientific perspectives and 'cultures' within policy-making institutions. For instance, Macnaghten & Chilvers, (2014) argue that "While there are many possible explanations for this lack of institutional reflection, a key aspect identified in interviews was the prevalence of unreflexive science policy cultures and the predominance of technocratic organisational structures." Previously, Wynne, (1993b) made a similar point, arguing how "the very un-reflexivity of science, and the corresponding lack of recognition of the reflexive dimensions of public responses to science, combine to obstruct practical progress [in incorporating public perspectives]". In other words, while normative motivations lie at the heart of science, science itself is very bad at recognising these societal assumptions that frame its practice. At the same time however, this is underpinned by a belief that science is a reflexive practice and that the public lack similar reflexivity. Dryzek et al (2008), looking at policymaking around Genetically Modified (GM) crops, similarly

points to cultural issues within policymaking. In particular, he highlights the lack of reflexivity of the technoscientific viewpoint, describing an 'elite' attachment to 'promethean' views of science, which leaves no space for more precautionary public perspectives that might be viewed as slowing down progress. More recently, Smallman, (2018) has argued that while the public perspectives elicited during public engagement might be relevant and insightful to policy, the public sociotechnical imaginary revealed within them (which sees downsides as inherent to and inseparable from the science itself) is more complex than the dominant scientific-led sociotechnical imaginary (which sees downsides as separate epiphenomena to be managed away) and therefore perhaps too difficult for policymakers to act upon.

Others have framed the mechanism by which these techno-scientific viewpoints work to exclude other perspectives in terms of power. Bora (2009), in looking at the impact of public participation on GM crop licencing, argues that participatory decision-making challenges the authority of law and science, by bringing other perspectives to bear. This encourages a collusive coupling between law and science (a "regime of technoscientific normativity") that excludes political (i.e. values based) discourse. Drawing on Bachrach & Baratz's (1963) argument that power means more than simply the power to make decisions – it also means the power to decide what decisions can and cannot be made - Welsh & Wynne (2013) have argued that science has been given authority beyond its role of providing facts and information to informing policy. It is also being "also allowed to declare which information is salient and which is not", and in so doing, science is given authority to decide public meanings. Similarly, Pickersgill (2011) looked at how legal policies around neuroscience were formed, by considering the 'sociotechnical imaginaries' at play. He concluded that the dominant sociotechnical imaginaries shared by those setting up anticipatory discourses determined which possible futures were on the table and which ones were not. Likewise, Hurlbut (2015) described how, by promising to

address societal challenges, scientific imaginaries of synthetic biology give science the authority “to declare what technological futures are possible, desirable, and good”.

These descriptions give a sense of how, in particular policy situations, public perspectives might be crowded out or deemed irrelevant by the dominant perspectives in the room. However, drawing on Latour’s argument (Latour, 2007 p66) that social ties are weak and that a power relationship that mobilizes nothing but social skills, cultures and norms would be very short-lived and transient, it does seem problematic to settle upon ‘power’ as the explanation for why alternative perspectives are not accounted for in policymaking without giving thought to the underlying mechanism(s) that allows this power to exist and to be exerted and extended. What is it that gives this power imbalance, and the technoscientific viewpoint, such strength, durability or ‘steeliness’ across time, geography and issue, despite deliberate efforts to disrupt it?

This paper seeks to consider this issue further, in the context of the apparent power and persistence of this technoscientific viewpoint in scientific policymaking. In particular, the paper asks: What is it that makes public policy resistance to public perspectives so enduring and what mechanism lies behind this resistance? Using Jasanoff and Kim’s theoretical concept of sociotechnical imaginaries to examine the relationship between knowledge, its application and power, I describe a series of interviews with UK policymakers which included former Government Ministers (elected politicians) from both of the UK’s major political parties, former chief scientific advisers (CSAs), former special advisors (who provide political advice to ministers) and former civil servants (government officials), on the topics of how evidence is balanced in the decision making process and how public participation is understood and valued. I argue that the ‘soft ties’ – the norms and collective

understandings shared amongst policymakers - do indeed explain some resistance to public perspective. However it is the way in which policymaking structures, laws and institutions have been built by those holding this technoscientific viewpoint and a particular elite sociotechnical imaginary of 'science to the rescue', thereby cementing and perpetuating that imaginary, that gives it its power, strength and endurance.

Throughout the paper I give selected and shortened quotes to illustrate the points made in the interviews. They are attributed only to the category of policymaker to which interviewee belonged in order to maintain anonymity, whilst still allowing any differences in perspective to be highlighted.

To begin, it was clear that what others have described as a 'technoscientific viewpoint' (Wynne 1993b, Dryzek 2008, Macnaughten and Chilvers 2014) or the 'elite' sociotechnical imaginary of 'Science to the Rescue' (Smallman, 2018) was indeed dominant in the minds of those policymakers interviewed: Science was seen as a problem solver and able to both build the economy and point to the 'right' solution. For instance, former CSAs and civil servants both described their roles in terms of securing the right evidence for good policymaking and former government Ministers were keen to emphasise the centrality of science in 'sound' decision making; uncertainties that came with science could be overcome with more science or knowledge; and the social and ethical issues relating to science were spoken of as epiphenomena, which could be separated from the science itself, then minimised and dealt with (by more science). This is particularly well illustrated by the following quote from a former CSA:

"Understanding what people care about is rather important because...once we understand the issues, the scientists can then think through, ok, so to address their issues, these are the sorts of research questions we need to be answering."

Former Chief Scientific Adviser

These features of the elite 'Science to the Rescue' imaginary (particularly the idea of risk and downsides being separable and controllable) have been previously contrasted with a public imaginary which sees science as producing problems as well as solutions and the benefits and disadvantages of science as contingent and unpredictable, but nevertheless deeply ingrained in the science (Smallman, 2018). The argument has been put forward that such differences are likely to influence policymakers' ability to accommodate such complex public perspectives, particularly by shaping regulatory structures (Hurlbut, 2015; Smallman, 2018). For instance, Hurlbut (2015) has described how scientists' perceptions of social and ethical issues as epiphenomena has had a profound effect on the shape of policy in the biosciences – generating the ELSI approach, which sees ethical considerations of science 'performed' outside the scientific research itself, for instance. So how does this 'elite' imaginary, evident in interviews with policymakers so far, affect the policymaking processes and mechanisms?

From the interviews it becomes apparent that the imaginary is indeed affecting the policymaking process in 'soft' ways (ie by shaping the preferences, cultures and norms at play). Specifically in the following three sections I will describe such mechanisms that were revealed in the interviews: Firstly, the elite imaginary is influencing the way science can be discussed and public perspectives expressed in public dialogue events; secondly, the elite imaginary is shaping how public perspectives are heard and understood by policymakers; Thirdly, this imaginary also defines what policymakers consider to be expertise and where they believe expertise can be found.

However, beyond this, it also became apparent in the interviews that the elite imaginary affected policymaking structures in less social and more concrete ways, by shaping the institutions and schemes of decision making within them. This cements and perpetuates that imaginary and give the technoscientific outlook a significant part of its power, strength and endurance. I will describe this in more detail in section 4 below.

1. Elite imaginary influencing the way science can be discussed and public perspectives expressed in public dialogue events

Others have argued elsewhere that the dialogue process is often dominated by expert understandings and imaginaries, rendering some futures possible and closing down others (Wynne, 2006b; Stirling, 2007; Welsh and Wynne, 2013b). Drawing on the comments of policymakers in interviews and examining the original reports of public dialogue activities, we found that this appears to be enacted through two commonly used rhetorical devices. Both of these devices were adopted to help bring emerging technologies to life, but, based upon the elite imaginary, were effective in shaping the discussion towards this same imaginary.

Firstly, 'hyperbolic framing', was common, whereby extreme conditions or terrible diseases were used to exemplify the purpose of a new technology. Whether intentional or not, this framing both reflected the elite imaginary's understanding of science as a problem solver, but also acted to promote this understanding too:

"The use of stem cells to better understand cancers and develop new drugs treatments was particularly supported."

Stem Cell Dialogue (ScienceWise, 2008)

“Nearly four fifths agree with using human embryos in research if it may help to understand some diseases, for example Parkinson’s or Motor Neurone disease.

Hybrids and Chimera dialogue (HFEA and Sciencewise, 2007)

Secondly, ‘abstracting’ was evident, whereby report authors argue that participants aren’t worried about the technology in principle, but have concerns about particular applications. This again reflected and engendered the elite imaginary of social and ethical issues as separate, rather than inherent parts of the science or technology:

“Reservations and fears tended to be about specific technologies and policies and some of these faded when more information was given.”

Science Horizons (Sciencewise, 2007)

“While overall animals containing human material research was seen as acceptable in principle, some things were seen to be towards or beyond the boundaries of acceptability”

Animals Containing Human Material Dialogue (Academy of Medical Sciences and Sciencewise, 2010)

While these rhetorical devices help bring abstract concepts to life for non-experts, together they express and promote aspects of the elite imaginary and create a situation where the public’s views can only be expressed and interpreted as a series of issues to be addressed or conditions for proceeding. This was echoed in a comment from a policymaker in an interview:

“I’ve been involved in one [public dialogue] on data...by the end of the dialogue the group had come up with a sort of set of principles around which data sharing was and wasn’t ok.”

Civil Servant

Furthermore, these examples show how the process of making a technology real enough to be discussed in the dialogue and thereby fixing participants’ understandings, draws very strongly on normative aspects of the elite imaginary. Stem cells move from being invisible cells in a dish, to being cures for cancer or spinal injuries, led by the scientists’ own visions, for example. As a result, discussions about potential uses are transformed into discussions of conditions for use of a particular technology, with very little room left for any concerns to have status beyond epiphenomena.

2. Elite imaginary shapes how public perspectives are elicited, heard and understood

Descriptions of the public perspectives expressed in public dialogue activities and elsewhere (for instance Kearnes *et al.*, 2006; Macnaghten and Guivant, 2010; Lock *et al.*, 2014; Smallman, 2018) suggest that public opinion is far from prohibitive or aiming to hold back science. Indeed in most accounts, the public is broadly supportive of science, sharing with the elite imaginary a sense of the progress that can be delivered by science and technologies, albeit tempered by concerns about possible downsides. The idea that policymakers are dismissing the views of the public because they set out to stifle scientific research or economic development (as others such as Dryzek *et al.* (2008) have argued) appears to be an over-simplification of public perspectives.

Instead however, the interviews suggest that the elite sociotechnical imaginary is acting as a distorting filter, rendering subtle public perspectives as simple objections – which can then only be ignored. In particular, the way that policymakers saw science as standing separately from the social and ethical issues appeared to be shaping how public views were being mis-heard as roadmaps, conditions for support or lists of issues to be addressed, rather than concerns about the kind of world being built with science, or genuine attempts to come to terms with the risks and ethical issues. The previous quote from a former CSA explaining that the purpose of dialogue was for the public to list concerns for science to address illustrates this point well, as does the following quote from a Civil Servant who was explaining the problem of values-based concerns creeping into policy discussions about the safety and science of genetically modified (GM) foods – they were definitely not connected in their view:

“You could argue that a lot of the anti GM lobby is much more about mechanisation and over-technologicalisation of agriculture and capitalism and the food chain and lots of things that have absolutely nothing to do with GM and the science.”

Civil Servant.

3. Policymakers’ imaginary shaping perceptions of ‘Expertise’

Beyond shaping how public views can be expressed, heard and understood, the policymakers ‘elite’ sociotechnical imaginary also appears to play a role in distinguishing what is considered to be expert opinion - reducing the impact of public voices further.

Throughout the interviews, a clear preference for ‘expert’ evidence was apparent. When pressed on what ‘expertise’ consisted of, interviewees invariably mentioned personal experience of the subject in question (“from the horse’s mouth”) or referred to a form of expert judgement that can be transferred from one field to another (“Intelligent commentary”). This idea of transferrable knowledge was particularly well illustrated by the following quote from a former CSA, explaining what they had learned from the role:

“And that’s the other thing you learn to be able to do is to say look, here’s an area I believe I am expert, here’s an area I believe I know enough to be able to say something sensible, here’s an area I don’t have enough knowledge. I’ll offer what will be some intelligent commentary, but recognise this is not my area of expertise.”

Former Chief Scientific Adviser

It is useful to note that the former CSA above was not trying to imply that they weren’t the right person to give advice on these issues outside their direct expertise, but that they wanted to explain how this direct expertise or expert knowledge enabled them to exert expert judgement in other areas.

In contrast to this transferrable expertise that enables CSAs to make expert judgements outside their fields, or the first-hand expertise of subject specialists, the CSAs in particular saw the public as simply drawing on their life experience and non-technical skills when they made judgements about science (arguably also outside their own fields). These were non-expert views and any differences between scientific and public perspectives could be explained by the public’s lack of expertise in making such judgements:

“There’s no rationale in the public response to some of these things. It’s not rational... you’re going to be talking about psychology, you’re going to be talking about community views, community values.”

Former Chief Scientific Adviser

However, further probing in interviews revealed that despite policymakers describing expertise as a substantive quality of what ‘experts’ know, the way in which they procure and judge expertise suggests that is a reflection of outlook. Being more precise, it is the ‘elite’ sociotechnical imaginary that the policymakers are seeking to elicit when identifying expertise. This was particularly well illustrated in a comment from a former civil servant who was describing how a previous Minister had been difficult to work with on GM policy, because they insisted on taking advice from scientists more aligned with the environment movement than with those doing GM research. Advice from the environmental expert, who did not share the same elite imaginary of ‘science to the rescue’, was regarded as non-mainstream and troublesome – very much as public perspectives are considered:

“Some of the Ministers had a particular view about what the evidence showed and they weren’t particularly open to alternative experts who challenged that view.... they had sourced expert views themselves and took those expert views as being correct... one particular minister was much more sympathetic to what you might call a non-mainstream view and was very keen that that view was always included.”

Civil Servant

4. The role of the elite imaginary in the machinery of government

So far I have described how the elite imaginary of ‘science to the rescue’ has worked to exclude public perspectives through ‘soft ties’ – the norms, cultures and practices of policymaking and the perspectives of policymakers. However, as I have argued in

the introduction, this does not sufficiently explain the resilience and power of the technoscientific viewpoint.

Furthermore, while there was evidence of this elite 'science to the rescue' imaginary being held across the range of policymakers interviewed, the policymakers also indicated that they understood science to be far more complex in a policy context than the imaginary might suggest. More precisely, when not answering questions specifically about the use of science in policymaking, they often described concrete instances of policymaking where science had not come to the rescue. For example the following quote from a former government minister:

“We know that the global temperatures are rising, what we don’t know is what will happen as a result. There are some possibilities; so actually learning to live with the ambiguity that science sometimes gives you is part of the job.”

Former Minister

This raises two interesting issues. Firstly, there is clearly a performative element to the science to the rescue imaginary. As I discuss further below, and in keeping with the findings of previous work (for instance Jasanoff, 2009; Lee, Natarajan, Lock, & Rydin, 2018), in the context of public controversies in particular, science is seen to be the 'correct' source of evidence and the route to 'impartial' and 'sound' decision making. Rather than simply being a reflection of how the policymakers see science being used in policymaking, in describing a particular science-governance relationship, the elite imaginary expresses how the policymakers understand salient forms of authority and expertise.

Secondly, despite expressing views that show they understand that the relationship between science, the public and policy is complex, policymakers nevertheless feel

unable to draw upon this complexity within policymaking. This appears to be more than public perspectives failing to meet what is considered to be the 'correct' form of evidence or expertise. Instead, the sophistication of the subtle arguments being put forward by the public are 'inconvenient' to the policymaking process. This is expressed very well in the following quote from a civil servant reflecting on their experience with a public dialogue exercise, in which they evoke an image of public perspectives 'not fitting' within policy in some way:

"It's neither 'the benefits are absolutely fantastic, you need to do this', nor 'the risks are dreadful you can't possibly do this'. The answer is obviously, is often we need to proceed with caution. And that's what comes out of public dialogue most of the time. And it seems to be a difficult ball game for the policymakers to square."

Civil Servant.

In the following section, I will explore these two points further, explaining how instead of the elite imaginary itself constraining the agency of policymakers to listen to public perspectives, it is the way in which the machinery of policymaking has been shaped around the elite sociotechnical imaginary, forcing evidence and expertise to take a particular 'form' that prevents them from taking these views into account. This in turn gives 'steeliness' and endurance to the technoscientific viewpoint: In order to be dealt with in the policymaking process, all issues are forced to take the form of the elite sociotechnical imaginary, regardless of the shape of the matter in hand, or the perspective of the policymaker(s) operating the system. Alternative views of science – even if they are considered to be sufficiently expert and are understood correctly – simply cannot be accounted for within the policymaking structure and process. This has the effect of cementing this imaginary, but also creating and perpetuating it, without the need for policymakers to engage with the substance of the imaginary.

Specifically, I am going to describe four ways in which this works: Firstly, scientific evidence have been given primacy over other forms of evidence within the parliamentary decision-making process; Secondly, arms-length bodies have been set up which aim to remove decision making from political influence and in so doing put scientific evidence – or the elite sociotechnical imaginary of science - front and centre; Thirdly, schemes of delegation have been arranged that split responsibility for science from responsibility for ‘other’ aspects of the issues; Fourth, the role of the judiciary (and its view of science as a source of facts) as a final check and balance. Later, I will go on to reflect on why such an arrangement has arisen and what that means for STS efforts to democratise science.

a. Primacy of scientific evidence in parliamentary and European decision making

I have already described how UK policymakers expressed a clear preference for ‘expert’ advice. The interviews also revealed how the primacy of scientific advice was more than a preference expressed by policymakers or a standard embedded in the culture of policymaking, but is a priority enshrined in the legislature – a priority that reduces the agency of policymakers to act on public evidence. While I will discuss the possible reasons for this focus later, I argue that this prioritization is based around the elite sociotechnical imaginary of science to the rescue – especially the understanding of science as solver of problems, and risk and uncertainty as quantifiable, manageable and addressable with more research.

This primacy of scientific evidence – and its role in disempowering policymakers - was raised in interviews, particularly in the context of European regulations, which, offer little (if any) space for non-scientific matters to be considered. This is expressed succinctly by the following quote from a Civil Servant:

“You could say that the public dialogue, in the sense of public opinion, had a very strong effect on policy where it could. But where you had this European Framework that was very strictly linked to the scientific evidence, then the government was playing with a very straight bat and voting where the direction of the scientific evidence was pointing”

Civil Servant.

The interviewees also described how the elite imaginary was perpetuated by this administrative requirement for scientific evidence. Since there was no way for social and ethical concerns to be dealt with in this process, policymakers described how they were forced to separate them from the science, thus enacting and perpetuating this aspect of the elite sociotechnical imaginary. However, this does not mean that decisions were being made in a purely technocratic way. In order to account for social and ethical concerns and bring about the desired policy outcome within a system that did not allow them to be considered legitimate sources of evidence, interviewees described how they – and other parties – expressed these concerns by challenging the science. This was summed up by a former civil servant, talking about the problems of basing policy on science alone:

“You might end up in the GM situation where ... the science becomes so dominant in the decision-making process around GM, that people are challenging the science, partly because they have other issues they want to express and there is no forum for them for doing that.”

Civil Servant

A more specific example is the description a former CSA gave of how their advice was called upon when it came to light that the UK's biofuels policy was causing food shortages in developing nations. They described how, since economic or social

evidence was an inadmissible basis for decision-making within European regulations, the Minister asked the scientists to come up with a different view of the science that would support their desire for a withdrawal of biofuels:

“[the secretary of state] said to us: “I can’t have a policy that does that [cause food shortages in other parts of the world], so I’m legally bound in Europe [to only act upon the scientific evidence], but I’m ethically bound to get myself out of this mess. I need some scientific evidence that shows what is a sensible trajectory to go down.”

Former CSA

Looking more closely at the European Commission’s decision-making process (the ‘ordinary legislative procedure’), it is possible to see the process that has elicited these responses from policymakers. The elite sociotechnical imaginary is clearly embedded and perpetuated, particularly in the way that the separation of social and ethical issues is at the heart of the legislative process. The European Commission’s description of the decision-making process begins by explaining how social, ethical and economic consequences of particular actions are dealt with before any new policy initiative is proposed:

*“Before the Commission proposes new initiatives it assesses the potential **economic, social and environmental** consequences that they may have. It does this by preparing ‘impact assessments’ which set out the advantages and disadvantages of possible policy options” (EUROPA - How EU decisions are made, 2017)*

These impact assessments are seen as the key point at which the public can participate in decision making, with a 4-week period of public consultation built in.

These consultation periods however are considered unnecessary when decisions are based upon scientific opinions from an agency or scientific committee, on which a public consultation has already taken place. However, the terms of reference of such scientific committees typically limit the basis of comments to scientific matters. For example the 2012 consultation on the potential health effects of exposure to electromagnetic fields (EMF) announced:

“In-line with its procedures for stakeholder dialogue, the European Commission is launching a public consultation on its request for scientific opinion on the potential health effects of exposure to EMF...Please note that only comments submitted in accordance with the ‘rules of procedure’ will be taken into account”

(Public consultation on the request for a scientific opinion on the potential health effects of exposure to electromagnetic fields (EMF) and call for information - European Commission, 2012)

These ‘rules of procedure’ explain how the focus of submissions must be based upon the scientific review, rather than any wider issues of risk or policy impact:

“The objective of public consultations is to gather specific comments and suggestions on the scientific basis of the opinion, as well as any other relevant scientific information regarding the questions addressed, in order to allow the Scientific Committees to focus on issues which need to be further analysed.

“This consultation process shall not deal with policy or risk management needs and measures. In addition, this particular consultation procedure should not be confused with other consultations launched by the Commission regarding policy or regulatory matters, for which a different scope, as well as rules and procedures apply.

In general, only submissions directly referring to the content of the pre-consultation opinion and relating to the issues that the report addresses will be considered.”

(European Commission, 2008)

Given this set of rules that both pigeonhole public input as focused on non-technical issues, while at the same time limiting any admissible input on scientific matters to purely technical comments, it is possible to see how public perspectives – or indeed any social and ethical issues - are firmly frozen out of any policy discussions. With the scope of the debate so limited to technical matters, social outcomes have to be ensured through the technical evidence. In this way, the social is forced to become the technical, yet the illusion of the social being separable from the technical is maintained and perpetuated.

b. Set-up of Agencies and schemes of delegation, that deliberately put scientific evidence – or the elite sociotechnical imaginary of science - front and centre

In the previous section I have described how decision-making frameworks, with which the UK Government must comply, put the elite sociotechnical imaginary at the heart of their criteria for evidence and decision-making, thus creating downwards pressure on governments to comply with and enact this imaginary. The interviews also showed how similar pressure was also created from an upward direction, by the decision-making powers of agencies and schemes of delegation. I argue that these arms-length bodies have been designed by those holding the ‘science to the rescue’ imaginary, and are therefore based around that imaginary. As I discuss more fully later, while some of the impetus for this approach is likely to be the desire to insulate decisions from other ‘political’ perspectives (Ezrahi, 1990), the effect is that by ensuring decisions are made by those holding this elite imaginary, direct authority is given to this technoscientific point of view which tends to separate and marginalise

social and ethical issues. At the same time, by locating decision-making one step further away from politicians (and arguably the democratic process), it becomes doubly difficult for alternative perspectives to be heard. Finally, the way in which these bodies draw upon science to come to a resolution, further reinforces the imaginary of science as an arbiter of risk and a problem solver.

These points were particularly well explained by a former CSA who was describing how they had recently designed and set up an intergovernmental organisation on a particular environmental issue, deliberately giving design power to the scientific (rather than other) stakeholders:

“There’s no question that those four original programmes have been totally designed by the scientists. Almost no input from the user community. A bit from government because they fund the research, so a bit from them, but they would be the bits of government that fund research, not necessarily the policy part of government.”

Former CSA

Further to that, the interviews also revealed how the scheme of delegation from government to such bodies is used to again limit the basis of decision making to technoscientific matters. For example, a former CSA described how they maintained power over deciding when to resume flights in UK airspace following the Icelandic volcano explosion in 2010 within their circle of scientific contacts, by passing decision making power from government departments to such an arms length body, which was more distanced from political influence:

“The science dominated because basically the Civil Aviation Authority were given the responsibility of saying this thing can be where we can fly safely because they had

the international authority to say where it was safe to fly, so [the Minister] kept his hands off it.”

Former CSA.

Others (Johnson, 2013; McCubbins et al., 1987) have argued that using decision-making structures to limit evidence to purely technical matters is an important way in which bureaucrats insulate their institutions from political influences and promote their own values and objectives. More generously perhaps, Ezrahi (1990) has argued that this focus on scientific evidence and processes, was initially a way of protecting decisions from partiality and providing accountability.

Interestingly however, the interviews revealed it is not just the bureaucrats who are encouraging this approach – a number of the former ministers interviewed indicated that this was also a key way in which they insulated themselves from controversial decisions. The following quotes illustrate this point. The first is a taken from a section of interview in which one former minister was criticising a current minister on what they felt was a failure to base a particularly controversial decision on scientific evidence – what they refer to in the quote as “the best way possible”:

“I think ministers expose themselves unless they can say with real confidence ‘we are doing this in the best way possible’. Because there are times when we are saying ‘evidence-based decision’, but there are times when the evidence isn’t fully there. In which case you need to make the decision about how to find the evidence. This could be controversial areas like GM technology. So that’s why we support and we put money into the security for the Rothamsted trials for the GM. It was politically very controversial at the time but we said we need to find the answers about whether GM will work in certain field based situations.”

Former UK Government Minister

The next quote is from another former minister, discussing a similarly controversial topic:

“I went out over and over again, publicly explaining the facts and why it’s so difficult and why nobody in their right mind really wants to have to do this, but why there aren’t any alternatives at the moment. And it’s really difficult. But I think that, as a minister, I had to rely absolutely on that scientific evidence.”

Former UK Government Minister

Again, what we can see from these quotes is this science to the rescue imaginary being invoked and reinforced - science is being seen as a problem solver, where the ‘politics’ of an issue can be separated out from the technical details. Regardless of whether or not the ministers in question believe that science can solve problems in this way, the imaginary offers a valuable way for politicians to make difficult decisions in the face of potential criticism or challenge. This reliance on scientific ‘facts’ in the face of difficult or controversial topics is reinforced by the possibility of a challenge or judicial review, which I discuss in more detail in the following section.

c. Role of judiciary as a final check and balance

In this final empirical section, I argue that the role of the judiciary in ensuring fair and sound decision-making is the fourth way in which this technoscientific ‘elite’ imaginary is both embodied and perpetuated in the policymaking system. More precisely, the threat of a judicial review, and the perception by policymakers that the judiciary considers scientific evidence to be the basis for impartial decision making, forces the separation of social and ethical issues from scientific issues and pushes technoscientific perspectives – of science as neutral and a problem solver – to the fore once more, thus excluding other viewpoints.

The following quote from a former Government Minister illustrates well how the concern over a potential judicial review – and the perception of the judiciary’s view of science as an impartial viewpoint – is shaping what constitutes evidence for policymaking, and how decisions are being made:

“I needed a lot of persuading that culling badgers was the right answer because who wants to cull badgers? Nobody wants to cull badgers. Everybody knows it’s going to be deeply unpopular to do it and you feel there must be another way....It’s going to be judicially reviewed because it’s so controversial, so I want to get this process absolutely right, because the worse thing to do would be to make the decision and then to have made a mistake by not knowing a key fact, or making an error in how we made the decision.... In a judicial review, if it can be shown that before you made the decision you had a previously declared view, your decision is unsound. So obviously we took legal advice as well, we had a QC advising us but the scientific advice was the most important thing.”

Former Minister

Studies of the legal process help explain this and reinforce this point that this is being underpinned by – and is reinforcing - the ‘science to the rescue’ sociotechnical imaginary. For example, Lees (2016), looking at the relationship between the judiciary, scientific advisers and administrative bodies in the planning process, describes how responsibilities for ‘facts’ and ‘judgement’ are allocated to scientific advisers and administrative bodies respectively. In the eyes of this legal process, scientific evidence is about facts, rather than judgement. Lees also describes how in judicial reviews, while the procedural steps that the decision-maker must take are clear, the place of discretion in such decisions is not clear. This lack of clarity on the place and role of discretion would arguably drive decision-makers further onto the

seemingly safer territory of science-based 'facts', making scientific evidence even more reassuring and important in the face of uncertainty.

Lee et al., (2018) consider this further. Looking at the use of scientific models in the legal planning process, they argue that even though all those involved are aware that models do not give accurate factual representations of risk or the situation in question, they do give a sense that these things are knowable, quantifiable and predictable, and that legitimate governance is therefore possible. I argue that in this way, the 'science to the rescue' imaginary of science as a way to know, manage and predict uncertainty, is offering a way to act and govern. Such 'evidence' then becomes a legal requirement and the imaginary becomes both embedded in the system, but also coproduced and perpetuated as the only form of reliable evidence allowable (Lee et al 2018).

Bringing these four points together then, these mechanisms both embody and enact and perpetuate the technoscientific viewpoint through the elite sociotechnical imaginary of 'science to the rescue'. The very machinery of policymaking – for both deliberate and pragmatic reasons – has become shaped around this imaginary, particularly its focus on science as a problem solver and on social and ethical issues as non-inherent parts of science. By forcing issues to take the form described by the elite sociotechnical imaginary, alternative views of science simply cannot be accounted for within the policymaking structure and process. In this way, the elite imaginary (and technoscientific viewpoint) is enacted and perpetuated, without the need for policymakers to engage with or even be aware of the imaginary underpinning their actions.

Discussion and Conclusions

In this paper, I set out to understand why the technoscientific viewpoint is so dominant in policymaking, what is behind its power and endurance, and why it might be so resistant to alternative perspectives – especially those expressed by the public in attempts to democratise scientific decision making. Using the theoretical framework of sociotechnical imaginaries, I have described how, in addition to ‘soft’ mechanisms that affect the shape of participatory discussions perceptions of public perspectives and ideas of expertise, there are a number of ‘hard’ mechanisms which help explain the power, strength and endurance of the technoscientific viewpoint despite deliberate efforts to disrupt it. In particular, I have described how policymaking structures and processes in the UK have been shaped by those holding the ‘elite’ sociotechnical imaginary of ‘science to the rescue’ – especially the idea that social and ethical issues are separable from the science and technology and uncertainty ultimately knowable, measurable and manageable. As a result, regardless of the perspectives of the individual policymakers, issues and views have to take this form in order to be processed; alternative views cannot be accounted for. In this way this elite sociotechnical imaginary – and the technoscientific viewpoint – is enacted but also elicited and perpetuated, thus accounting for its persistence and resilience. Rather than public perspectives being ignored or out-competed by other evidence or priorities relating to the technoscientific viewpoint then, the machinery of government is crucial in shaping how public perspectives can be heard and accommodated in policy. In the context of a policymaking system shaped around the ‘science to the rescue’ imaginary, nuanced arguments that leave issues open and see risks or uncertainties as inherent to new technologies and unknowable are rendered invisible, misunderstood as opposition, or impossible to take into account.

The interviews also show that the machinery of policymaking isn’t entirely flexible and malleable. While administrative arrangements are clearly constructed to reflect the values of the scientific elite involved in developing them and are therefore

capable of being changed, they are not under constant revision and are embedded in other processes (for instance, the judicial review process that oversees standards of decision making; or less formal expectations around accountability required within democratic settings) so are 'fixed' in some ways. As a result, the machinery of policymaking make some potential actions or considerations more or less legitimate or likely. Rather than policy options being defined entirely by external factors (the ideas and values of the policymakers involved/scientific evidence available) they are shaped by administrative arrangements too.

It is not my purpose in this paper to elucidate *how* these mechanisms have come to be, although that would undoubtedly be an interesting question for more historic research. Instead, I would like to consider some of the reasons *why* these limiting processes have been designed and adopted. Importantly, rather than emerging deliberately to privilege the interests of one group over another, there are very practical and democratic reasons why such an arrangement might have come to be.

To begin, as the interviews with politicians in particular showed, while prioritising scientific evidence presents some limitations for policymaking, the systems I have highlighted allow decisions to be made in conditions of considerable uncertainty and in-keeping with the timescale and transparency requirements of what is considered to be good governance. They also allow politicians to act on controversial issues and in situations where accusations of bias are common.

Previously, others (March and Olsen, 1983; McCubbins, Noll and Weingast, 1987) have looked at the impact of administrative structures on decision-making, in the context of the principal agent problem of bureaucratic compliance – how elected politicians (and therefore the democratic process) can retain control of policymaking when dealing with bureaucracies. They argue that instead of the traditional view of

administrative procedures as a means of assuring fairness and legitimacy in decisions by administrators (or giving a sense of legitimacy, as Ezrahi (1990) argued), administrative procedures are one of the mechanisms for inducing compliance with political priorities. Specifically, by affecting the institutional environment in which decisions are made, administrative procedures limit the range of feasible policy actions available, enabling political leaders to be confident that their priorities are being enacted, without being involved in or knowing the details of every decision being made.

However, while the findings here echo McCubbins et al's description of administrative procedures "channelling decisions" in particular ways, it is not entirely clear that this is always in the direction preferred by political overseers, nor that it ensures that decisions are responsive to the interests and preferences of citizens, as McCubbins et al claim. For instance, as well as pointing out how these mechanisms work to resist public perspectives, I have described how Government Ministers have had to circumvent the systems and challenge the science in order to ensure their preferences were expressed and acted upon. Moreover, I have also described how former CSAs have boasted about creating systems that insulate decisions from political priorities. Others have described similar cases where politicians have had to 'twist' the science (or at least search for alternative sciences or change the framing of 'evidence') in order to achieve the political outcomes they had been democratically elected to enact (for instance Dunlop & James, 2007); or how building institutions that prioritise scientific evidence has been used as a deliberate strategy to avoid political confrontations, particularly on an international level (for example Johnson 2013).

While it is clear that the machinery of government affects and limits the possible range of outcomes of policymaking, this is not simply a matter of ensuring the will of

the elected politicians is enacted. Nor is it one of capture, whereby the machinery of government is shaped by and therefore works in the interests of the dominant technoscientific-minded group. Instead, there is an on-going tension and negotiation between the need to enact political priorities and the need to make difficult decisions whilst being accountable and democratic in the face of uncertainty. This results in a policymaking system that is a constant compromise between one that serves the public interests by being flexible, permeable to outside influences and able to accommodate complex perspectives, and one which is capable of enacting political priorities in a timely, transparent and accountable manner, so is more rigid, and limits the range of decisions and perspectives possible.

The importance of the 'Science to the Rescue' imaginary also tells us something about salient forms of knowledge and expertise in the policymaking setting. Despite their day to day experience of using science in a policy setting – which a number of policymakers acknowledged as being complex – policymakers nevertheless draw upon the imaginary (and the idea of science as a means to know, quantify and manage uncertainty) to describe 'correct' and 'sound' bases for decision making. Experts also appear to be selected upon their adherence to this imaginary, with more complex perspectives being described as 'non-mainstream' and public perspectives being seen as non-expert and irrational. Coupled to that, a number of interviewees demonstrated very clearly how salient knowledge and appropriate expertise is coproduced with ideas of transparency and accountability within various democratic contexts (Ezrahi, 1990; Jasanoff, 2005; Lee *et al.*, 2018): For instance, the former government minister who expressed anxiety about the possibility that controversial decisions could be called into judicial review and explaining how this made it particularly important to draw on scientific evidence. Ironically however, this desire for transparency and accountability has had the very opposite effect, forcing arguments about values become hidden from sight and buried within technical

discussions. This was particularly well illustrated by the description (above) of how a former CSA was asked by a Minister to find 'other' science that would allow a different (values based) position to be taken on biofuels.

This point about salient forms of knowledge and expertise raises an important question about the wider relevance of this research. The research was carried out in the UK and some of the interviews date back to 2014. Previous work that has shown the cultural specificity of public reasoning (Jasanoff, 2005) and we have seen significant political shifts in the intervening period. In particular, declarations such as that made by the UK's former education secretary Michael Gove who claimed during the 2016 European Referendum campaign, that the British people had "heard enough from experts", suggest that there might have been a shift in the way in which expertise is valued. So are these findings applicable elsewhere or even in the UK today?

Rather than being surpassed by issues such as Brexit however, the research described here helps shed light on why public discourse has come to be so distrustful of elite and expert positions. I have described how a very particular kind of expertise has come to be valued within policymaking and how, time and time again, attempts to get public perspectives incorporated into policymaking have been misheard or lost within a decision-making system that cannot accommodate perspectives that do not take the form of the elite 'science to the rescue' sociotechnical imaginary. I have also described how, in the face of a system (which includes the decision-making processes of the European Commission) that only permits a particular form of scientific evidence, even politicians have found it difficult to take account of non-technical matters such as values-based concerns and so have come to use the science itself as a way to ensure decisions reflect public values. In this way important debates about values become hidden within technical

discussions. In light of this, perhaps it is not surprising that the British Public rallied around the Brexit rally cry – to “take back control”.

Jasanoff and Simmet’s (2017) analysis of the ‘post truth’ moment in the US makes a similar point about how a focus on scientific evidence has forced value concerns to be played out technical debates, suggesting that the findings in this paper are indeed relevant to today’s situation in the UK and beyond. They argue that the term “post truth” is inaccurate and ahistorical because it suggests that there was a time when ‘truth’ guided politics. Rather than a recent moment of change, they argue that what we are witnessing is the continuation of a longstanding situation where normative values and judgments are deeply embedded in the way in which we create and make use of knowledge and expertise. As a consequence, ‘facts’ replace the need to give moral justification for political decisions and, in keeping with the findings in this paper, knowledge controversies arise as stand ins for questions about the kind of futures to which people aspire. This paper explains some of the mechanisms at play in these instances and provides empirical evidence of this phenomenon.

So where does all this leave the decades long move to democratise science? Firstly this research reveals a significant tension between different understandings of how democracy is enacted. While STS scholars and practitioners argue that actions to increase participation and challenge technoscientific views and assumptions in policymaking is a way to democratise science and technology, it is clear that this is problematic in the face of the machinery of policymaking – which others (McCubbins, Noll and Weingast, 1987) argue has been put in place to ensure democratically preferred outcomes.

Looking in more detail at the practices of deliberation and participation, I have described two mechanisms by which the elite imaginary influences the way science

can be discussed and public perspectives expressed in public dialogue events. van Oudheusden, (2014) has previously highlighted the how dialogue practices within the Responsible Research and Innovation context (which is arguably a recent extension of the academic context within which the participatory approach to science and society grew) largely ignore what he categorises as questions about the 'politics in deliberation' (ie how actors craft ideas of responsibility through argument) and the 'politics of deliberation' (ie how a particular form of democracy is privileged within RRI). The findings in this paper add to these points, particularly by shedding light on the mechanisms at play within the 'politics in deliberation'. Specifically, the way the techniques and rhetorical strategies used to bring future technologies to life for public participants both reflect and perpetuate the elite imaginary, leaving the public with very little room to offer alternative perspectives or express little more than conditions for support. Further to that however, given the way in which these mechanisms both conceal but nevertheless close off potential alternative futures, I would add the 'politics of futures' to the list of power considerations that are left un-discussed in current science and the public models taken up by policymakers – such as the EU's RRI and Open Science agendas.

Throughout the interviews however, politicians and civil servants were keen to point out the importance of involving public perspectives in decision-making. Civil servants reported that their involvement in public participation exercises were positive, useful and insightful experiences; politicians repeatedly referred to public opinion, voter preferences and the importance of values in decision making. Nevertheless, as the quotes above have shown, they were aware of the challenges of incorporating these views in policymaking as a result of the processes, procedures and accountability involved.

This raises some significant challenges for those advocating public participation as a way to democratise science. In recognition of the difficulty of getting public viewpoints heard in policy, there have been recent calls for the values and visions of scientists and decision-makers to be brought out into the open and subjected to scrutiny and debate (Wynne, 2006b; Jasanoff and Hurlbut, 2015; Smallman, 2018). While this is valuable, it is unlikely to be sufficient if, as I have described, these values and visions are so cemented into the machinery of policymaking and self-perpetuating. Instead, widening our focus to scrutinise and debate the values and visions embedded in these bureaucratic systems and processes, in addition to the values and visions of the individuals involved in creating them, is necessary. Furthermore, we should also move our gaze to the space where these values and viewpoints are negotiated before they get cemented into structures – the political rather than policy sphere.

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